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Attn: Docket No. 03-101-2

The Environmental Sciences Technology Center of Monsanto Company submits this comment in response to the Animal and Plant Health Inspection Service's notice of intent to prepare an environmental impact statement and proposed scope of study (69 FR 57257). This comment is to specifically address the impact on threatened and endangered species of using alternative herbicides to control glyphosate-tolerant creeping bentgrass.

Monsanto requested that the environmental consulting firm Compliance Services International conduct an assessment of the potential impacts on threatened and endangered species from the use of alternative herbicides to control glyphosate-tolerant creeping bentgrass if it were to spread from seed production areas in Oregon or Idaho. The attached study identified the threatened and endangered species in the affected areas and concluded that, should a nonglyphosate herbicide be needed for control of bentgrass in those areas, numerous herbicides would be available that would have no impact on threatened or endangered species.

Respectively,

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Environmental Sciences Technology Center
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St. Louis, MO

Endangered Species Assessment of Alternative Herbicides for Control of Glyphosate Tolerant Creeping Bentgrass

Prepared for Monsanto Company and The Scotts Company

by

COMPLIANCE SERVICES INTERNATIONAL

Compliance Services International
7501 Bridgeport Way West
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November 30, 2004

1. Introduction and Objective

In Federal Register Vol. 69, No. 185, dated September 24, 2004 (Docket No. 03–101–2), the USDA provided a notice of intent to prepare an environmental impact statement (EIS) and proposed scope of study in association with a petition by Monsanto Company and The Scotts Company for deregulation of genetically engineered glyphosate-tolerant (GT) creeping bentgrass (Roundup Ready®) (GTCB). In response to this notice, Monsanto and Scotts requested that Compliance Services International (CSI) conduct an endangered species assessment.

In locations where GTCB is allowed to flower, it is possible that seed or pollen transport by, for example, wind or water, may lead to unintended growth of the plant in surrounding areas or the unintended transfer of the gene governing glyphosate tolerance to non-GMO creeping bentgrass or other related plant species. In order to control the unintended growth of GTCB or glyphosate-tolerant genetically-modified hybrid species (GT hybrids), herbicides containing active ingredients other than glyphosate may need to be used. The objective of the work described in the current document is to provide information for use in Monsanto and Scott's response to the USDA notice of intent by (1) identifying the potential use area for such "alternative" herbicides, (2) identifying the federally listed Threatened and Endangered (T&E) species that exist in the potential use area, (3) identifying whether the use of the alternative herbicides has the potential to affect the T&E species in the potential use area, and (4) for any alternative herbicides that do have the potential to affect endangered species, identifying or proposing protective measures. In a report on the potential impacts from the release of glyphosate- (and glufosinate-) tolerant creeping bentgrass that was commissioned and funded by USDA APHIS, the Weed Science Society of America identified a total of 32 alternative herbicides for possible use on *Agrostis* (bentgrass) spp. or *Agrostis* hybrids (Banks *et al.*, 2004) (Table 1), all of which are considered in this endangered species assessment.

The assessment findings presented here are focused on three sites in Oregon and Idaho where the GTCB is grown for seed (Figures 1 and 2). As a result, the findings provide a targeted local evaluation rather than a broad national perspective with respect to the possible endangered species concerns that may arise due to the presence of GTCB or GT hybrids. The methods described in the report are, however, appropriate for assessments at any geographic scale.

Contributors to the assessment are as follows:

- Thomas Priester, Ph.D. – Senior Environmental Scientist, Compliance Services International. Over 22 years experience in pesticide regulatory science and registration, including work at DuPont Agricultural Products as a full time researcher in metabolism, environmental fate, and ecotoxicology.
- Larry Turner, Ph.D. – Consulting Ecotoxicologist, Compliance Services International. Over 27 years experience at U.S. EPA on chemical risk assessment, including 15 years as a full-time specialist on endangered species.
- Bernalyn McGaughey – President, Compliance Services International. Thirty years experience in pesticide technical and regulatory support and assessment, including ten years supporting the resolution and fulfillment of data requirements for endangered species pesticide assessments.
- David Howes, Ph.D. – Geospatial Information Scientist, Compliance Services International. Twelve years experience in Geographic Information Systems analysis, fluvial geomorphology, and environmental information systems development, including three years supporting the resolution and fulfillment of data requirements for endangered species pesticide assessments.

Table 1. Alternative herbicides available for use in treating bentgrass, *Agrostis* spp. (Banks *et al.*, 2004)

Active Ingredient	Level of Control	Comments
Atrazine	Fair to good	Postemergence
Bromacil	Good to excellent	Some selectivity when grasses are dormant
Clethodim	Fair to excellent	Foliarly applied Complete control on seedlings. Repeated applications needed for established plants.
Dazomet	Excellent	Expensive; difficult to apply Volatile fumigant
Dimethenamid	Good	Seedling control only
Diuron	Good to excellent	Soil applied Seedling control only
Ethofumesate	Good	Seedling control only
Fluazifop	Fair to excellent	Foliarly applied Complete control on seedlings. Repeated applications needed for established plants. Not selective in turfgrass
Foramsulfuron	Fair to excellent	
Glufosinate	Good to excellent	Foliarly applied Good on GTCB
Glyphosate*	Fair to excellent	Only likely to be used in GTCB growing sites for control of other vegetation
Hexazinone	Good to excellent	Lower rates selective
Imazapic	Good to excellent	Higher rates on established perennials. Selective at lower rates; higher rates on established grasses; split applications needed for perennials. Used in conservation areas and pastures in the west to control redtop; would also control *Agrostis stolonifera.*
Imazapyr	Good to excellent	Not selective
Imazaquin	Fair	
Isoxaflutole	Good to excellent	Partially selective turfgrass weed control
Mesotrione	Excellent	Partially selective turfgrass weed control
Metolachlor	Good	Seedling control only
Metribuzin	Good	Seedling control only
Nicosulfuron	Fair to good	
Norflurazon	Excellent	Soil applied
Oryzalin	Excellent	Soil applied
Oxyfluorfen	Good	Seedling control only
Paraquat	Fair	
Pendimethalin	Good to excellent	Soil applied Seedling control only
Pronamide	Good to excellent	Seedling control only
Quizalofop	Fair to excellent	Not selective in turfgrass
Sethoxydim	Good to excellent	Foliarly applied Complete control on seedlings. Repeated applications needed for established plants.

Active Ingredient	Level of Control	Comments
Sulfometuron	Good	Multiple applications in established grasses
Sulfosulfuron	Good	
Trifloxysulfuron	Good	
Trifluralin	Excellent	Soil applied

* Glyphosate is included in the table due to its use on bentgrass.

2. Scope of Assessment

a. Areal Extent of Assessment

The endangered species assessment described in this report is centered on the only three locations established for the growth of GTCB to provide grass for seed. One of these locations is in Jefferson County, Oregon (Figure 1) while the other two are in Canyon County, Idaho (Figure 2). All three sites are found in irrigated agricultural areas surrounded by shrub-steppe ecosystems.

The Jefferson County, Oregon growing site is in the north central part of the county at an average elevation of 2000 ft on a plateau above the Deschutes River, which runs 0.6 miles to the west. The area is relatively arid with the mean monthly rainfall during the April-September growing season totaling only 0.61 inches, as recorded for nearby Madras, Oregon. Very little runoff will typically occur from the site, but any runoff that might occur will drain into the Deschutes River.

The main growing site in Canyon County, Idaho is in the extreme northwest corner of the county on undulating terrain at an average elevation of 2300 ft and approximately one mile from the Boise River and one mile from the Snake River at their confluence along the Oregon-Idaho border. The climate is very similar to that of the Jefferson County growing site. In this case, runoff could occur into both of the nearby rivers. The much smaller second growing site is located to the south at an elevation of 2477 ft in an area that also drains into the Boise River.

In determining the full area of concern in the assessment, several factors are of importance. These include, but are not limited to, (1) the distance over which seed or pollen may be transported by water or wind, (2) the likelihood that GTCB will grow in an area or that the gene governing glyphosate tolerance will be transferred to non-GMO creeping bentgrass or other related plant species, and (3) the area potentially affected by the use of the so-called alternative herbicides to control the unintended growth of glyphosate-tolerant plant species. The full extent of the area under consideration in the assessment is, therefore, dependent upon the hydrological and meteorological characteristics of the areas within and around the growing sites.

Watrud *et al.* (2004) suggest that wind may transport pollen up to 12.5 miles and seeds up to one mile from their source, with the possibility of being deposited in terrestrial or aquatic habitats. Seeds may travel much greater distances in water and could, for example, be washed into wetland areas adjacent to the waterbody. Should that happen, GTCB could begin to grow in the vicinity of aquatic habitats. In general, however, it is very difficult to predict the fate of seeds or pollen escaping from the areas where flowering GTCB is grown. It is therefore very difficult to determine the precise use area for the alternative herbicides. Nevertheless, the use of alternative herbicides in both terrestrial and aquatic habitats must be considered.

With respect to water transport, seed from the GTCB growing site in Jefferson County could be transported downstream in the Deschutes River into Wasco County to the north. From the GTCB growing site in Canyon County, seed could be transported downstream in the Boise River and then into the Snake River. However, consideration of downstream counties along the Snake River is not required. The reason

for this assertion is that if direct or indirect pesticide effects are not encountered in the Boise River, it follows that pesticide effects should not arise in the larger Snake River where dilution effects will be great. Wind, however, may transport seed and pollen into neighboring Malheur County and Payette County, thus requiring their inclusion in the assessment.

Taking the above considerations into account, Monsanto and Scotts and CSI have jointly agreed that the area covered by the set of five counties discussed above (Jefferson, Wasco, and Malheur counties in Oregon and Canyon and Payette counties in Idaho) is representative of the potential use area for the alternative herbicides.

b. Endangered Species Assessment Considerations

The endangered species assessment presented in this report addresses the potential pesticide effects on T&E species that might result from growing GTCB at the sites identified above. The criteria used in the assessment are the same as those used by the U.S. EPA Office of Pesticide Programs (OPP) (U.S. EPA, 2004); analytical procedures are also comparable, as adjusted to deal with multiple pesticides and limited areas. The following considerations are included in the endangered species assessment.

i. Direct effects: Any effects that would directly affect individuals of a T&E species. Acute effects are typically based upon lethality (LC50) with a generous safety margin to account for acute sublethal effects and/or effects on individuals. Chronic effects are based upon any statistically significant adverse effect found in long term tests.
ii. Indirect effects: Any pesticide effects on populations of organisms that provide food or cover for T&E species. Criteria are less stringent for indirect effects than for direct effects because it is necessary only to protect populations, rather than individuals, of food and cover species.
iii. Adverse modification of designated Critical Habitat: Although typically directed towards construction or other structural alteration of designated Critical Habitat, adverse modification may occur as a result of pesticide effects on food or cover. For pesticides and for the purpose of this assessment, indirect effects are the same as adverse modification of designated Critical Habitat and are therefore not considered independently.
iv. Species proposed for listing: In addition to T&E species, species proposed for listing are, according to the ESA regulations, also required to be addressed in the endangered species assessment presented here. However, there are no proposed species in the potential use area for the alternative herbicides.

If the assessment indicates that one or more pesticides "may affect" a listed T&E species, then OPP must determine whether that effect is likely to be adverse. If this is the case, formal consultation with the Fish and Wildlife Service and/or the National Oceanic and Atmospheric Administration (the Services) is required. If the effect is not likely to be adverse, then OPP may complete an informal consultation internally in accordance with joint counterpart regulations at 50CFR402.40-48. A determination of "no effect" or "not likely to adversely affect" may be based upon precautionary measures put in place specifically to address T&E species concerns.

OPP uses a tiered approach to risk assessment, starting with assumptions of maximum exposure and toxicity. If a pesticide is practically non-toxic to a tested, representative taxon of a listed species, there is no effect. If exposure under maximum label conditions (e.g., application rates, methods, timing) and vulnerable field conditions (e.g., high runoff and drift potential) into a small farm pond surrounded by a crop to which the pesticide is applied, is below the criteria of concern, there is no effect. If an effect is possible under such maximum conditions, more refined exposure analyses are done, involving more site-specific and crop-specific parameters, to determine whether exposure still exceeds criteria of concern. A similar approach is used in the current assessment. However, the aquatic ecosystems considered in this assessment are medium-sized rivers which would provide significantly more dilution and shorter residence times than a small farm pond.

If, after the above tiered assessment, there is still a likelihood that a pesticide may adversely affect a T&E species, then formal consultation requirements will also involve an analysis of cumulative effects, interrelated and interdependent effects, and other components in accordance with 50CFR402.14 and the Services" Consultation Handbook.

c. Federally Listed Threatened and Endangered (T&E) Species in Oregon and Idaho

The endangered species assessment begins by considering all T&E species that occur in Oregon and Idaho (Table 2). Figures 3-8 show the number of species in each taxonomic grouping in each county in the two states of interest.

Table 2. Federally listed species in Oregon and Idaho

Taxa	Species	County
Birds	Bald eagle (*Haliaeetus leucocephalus*)	ID: Bannock, Bear Lake, Benewah, Bingham, Blaine, Boise, Bonner, Bonneville, Boundary, Butte, Camas, Canyon, Caribou, Cassia, Clark, Clearwater, Custer, Elmore, Franklin, Fremont, Gem, Gooding, Idaho, Jefferson, Jerome, Kootenai, Lemhi, Lewis, Madison, Minidoka, Nez Perce, Owyhee, Payette, Power, Shoshone, Twin Falls, Valley, Washington OR: Baker, Benton, Clackamas, Clatsop, Columbia, Coos, Crook, Curry, Deschutes, Douglas, Grant, Harney, Hood River, Jackson, Jefferson, Josephine, Klamath, Lake, Lane, Lincoln, Linn, Malheur, Marion, Morrow, Multnomah, Polk, Tillamook, Umatilla, Union, Wallowa, Wasco, Washington, Wheeler
Birds	Brown pelican (*Pelecanus occidentalis*)	OR: Clatsop, Coos, Curry, Lane, Lincoln, Tillamook
Birds	Marbled murrelet (*Brachyramphus marmoratus marmoratus*)	OR: Curry, Douglas, Lane, Lincoln, Polk, Tillamook
Birds	Northern spotted owl (*Strix occidentalis caurina*)	OR: Benton, Clackamas, Clatsop, Columbia, Coos, Curry, Douglas, Hood River, Jackson, Josephine, Klamath, Lake, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Wasco, Washington, Yamhill
Birds	Western snowy plover (*Charadrius alexandrinus nivosus*)	OR: Clatsop, Coos, Curry, Douglas, Lane, Lincoln, Tillamook
Fish	Borax lake chub (*Gila boraxobius*)	OR: Harney
Fish	Bull trout (*Salvelinus confluentus*)	ID: Ada, Adams, Boise, Bonner, Boundary, Canyon, Clearwater, Custer, Elmore, Idaho, Kootenai, Lemhi, Lewis, Nez Perce, Owyhee, Valley, Washington OR: Baker, Clackamas, Deschutes, Gilliam, Grant, Hood River, Jefferson, Klamath, Lake, Malheur, Multnomah, Polk, Sherman, Umatilla, Union, Wallowa, Wasco, Wheeler, Yamhill

Taxa	Species	County
Fish	Chinook salmon (*Oncorhynchus tshawytscha*)	ID: Adams, Blaine, Clearwater, Custer, Idaho, Latah, Lemhi, Lewis, Nez Perce, Valley OR: Benton, Clackamas, Clatsop, Columbia, Gilliam, Hood River, Lane, Linn, Marion, Morrow, Multnomah, Polk, Sherman, Umatilla, Union, Wallowa, Wasco, Washington, Yamhill
Fish	Chum salmon (*Oncorhynchus keta*)	OR: Clatsop, Columbia, Multnomah, Washington
Fish	Coho salmon (*Oncorhynchus kisutch*)	OR: Benton, Clatsop, Columbia, Coos, Curry, Douglas, Jackson, Josephine, Klamath, Lane, Lincoln, Polk, Tillamook, Washington, Yamhill
Fish	Foskett speckled dace (*Rhinichthys osculus ssp.*)	OR: Lake
Fish	Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*)	OR: Harney
Fish	Lost river sucker (*Deltistes luxatus*)	OR: Klamath
Fish	Hutton tui chub (*Gila bicolor ssp.*)	OR: Lake
Fish	Oregon chub (*Oregonichthys crameri*)	OR: Benton, Clackamas, Lane, Linn, Marion, Polk
Fish	Shortnose sucker (*Chasmistes brevirostris*)	OR: Klamath
Fish	Sockeye salmon (*Oncorhynchus nerka*)	ID: Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce OR: Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Sherman, Umatilla, Wallowa, Wasco
Fish	Steelhead (*Oncorhynchus mykiss*)	ID: Adams, Blaine, Clearwater, Custer, Idaho, Latah, Lemhi, Lewis, Nez Perce, Shoshone, Valley OR: Baker, Benton, Clackamas, Clatsop, Columbia, Crook, Gilliam, Grant, Hood River, Jefferson, Lane, Linn, Marion, Morrow, Multnomah, Polk, Sherman, Umatilla, Union, Wallowa, Wasco, Washington, Wheeler, Yamhill
Fish	Warner sucker (*Catostomus warnerensis*)	OR: Lake
Fish	White sturgeon (*Acipenser transmontanus*)	ID: Boundary
Insects	Fender's blue butterfly (*Icaricia icarioides fenderi*)	OR: Benton, Lane, Polk, Yamhill
Insects	Oregon silverspot butterfly (*Speyeria zerene hippolyta*)	OR: Clatsop, Lane, Lincoln, Tillamook, Yamhill
Mammals	Columbian white-tailed deer (*Odocoileus virginianus leucurus*)	OR: Clatsop, Columbia

Taxa	Species	County
Mammals	Gray wolf (*Canis lupus*)	ID: Adams, Benewah, Blaine, Boise, Bonner, Bonneville, Boundary, Clark, Clearwater, Custer, Fremont, Idaho, Kootenai, Lemhi, Shoshone, Valley
Mammals	Grizzly bear (*Ursus arctos horribilis*)	ID: Bonner, Boundary, Clearwater, Fremont, Idaho, Shoshone, Teton
Mammals	Northern Idaho ground squirrel (*Spermophilus brunneus brunneus*)	ID: Adams, Valley
Mammals	Woodland caribou (*Rangifer tarandus caribou*)	ID: Bonner, Boundary
Plants	Applegate's milk-vetch (*Astragalus applegatei*)	OR: Klamath
Plants	Bradshaw's desert-parsley (*Lomatium bradshawii*)	OR: Benton, Lane, Linn, Marion, Polk
Plants	Cook's lomatium (*Lomatium cookii*)	OR: Jackson, Josephine
Plants	Gentner's fritillary (*Fritillaria gentneri*)	OR: Jackson, Josephine
Plants	Howell's spectacular thelypody (*Thelypodium howellii spectabilis*)	OR: Baker, Union
Plants	Kincaid's lupine (*Lupinus sulphureus (=oreganus) ssp. kincaidii (=var. kincaidii)*)	OR: Benton, Douglas, Lane, Linn, Polk, Yamhill
Plants	Large-flowered wooly meadowfoam (*Limnanthes floccosa grandiflora*)	OR: Jackson
Plants	MacFarlane's four-o'clock (*Mirabilis macfarlanei*)	ID: Idaho OR: Wallowa
Plants	Malheur wire-lettuce (*Stephanomeria malheurensis*)	OR: Harney
Plants	Nelson's checker-mallow (*Sidalcea nelsoniana*)	OR: Benton, Clackamas, Linn, Marion, Polk, Tillamook, Washington, Yamhill
Plants	Rough popcornflower (*Plagiobothrys hirtus*)	OR: Douglas
Plants	Spalding's catchfly (*Silene spaldingii*)	ID: Idaho, Lewis, Nez Perce OR: Wallowa
Plants	Water howellia (*Howellia aquatilis*)	ID: Kootenai, Latah
Plants	Western lily (*Lilium occidentale*)	OR: Coos
Plants	Willamette daisy (*Erigeron decumbens var. decumbens*)	OR: Benton, Lane, Linn, Marion, Polk
Snails	Banbury springs limpet (*Lanx spp.*)	ID: Elmore, Gooding
Snails	Bliss rapids snail (*Taylorconcha serpenticola*)	ID: Elmore, Gooding, Twin Falls
Snails	Bruneau hot springsnail (*Pyrgulopsis bruneauensis*)	ID: Owyhee
Snails	Idaho springsnail (*Fontelicella idahoensis*)	ID: Elmore, Owyhee
Snails	Snake river physa snail (*Physa natricina*)	ID: Elmore, Gooding, Owyhee, Twin Falls
Snails	Utah valvata snail (*Valvata utahensis*)	ID: Elmore, Gooding, Power

d. Federally Listed Threatened and Endangered (T&E) Species in Potential Use Area

By focusing only on the potential use area for the alternative herbicides, the list of species requiring analysis is reduced as shown in Table 3.

Table 3. Federally listed species in potential use area

Taxa	Species	County
Birds	Bald eagle (*Haliaeetus leucocephalus*)	OR: Jefferson, Malheur, Wasco ID: Canyon, Payette
	Northern spotted owl (*Strix occidentalis caurina*)	OR: Wasco
Fish	Bull trout (*Salvelinus confluentus*)	OR: Jefferson, Malheur, Wasco ID: Canyon
	Steelhead (*Oncorhynchus mykiss*)	OR: Jefferson, Wasco
	Sockeye salmon (*Oncorhynchus nerka*)	OR: Wasco
	Chinook salmon (*Oncorhynchus tshawytscha*)	OR: Wasco
Insects		None listed in potential use counties
Mammals		None listed in potential use counties
Plants		None listed in potential use counties
Snails		None listed in potential use counties

As described below, habitat characteristics and behavior preclude some of the species listed in Table 3 from being considered at risk from the use of alternative herbicides in certain counties, whereas the remaining species and counties require further consideration.

Bald Eagle

In all five counties under consideration, the Bald eagle may occur along streams during the spring and summer, although they tend to be found near lakes, ponds, and other slow-moving waterways rather than along rivers. Eagles could be exposed to the alternative herbicides by eating fish that have taken up one of the herbicides from the water. In addition, terrestrial animals could comprise some of the eagle diet. The potential effects of the alternative herbicides on Bald eagles must therefore be examined in detail.

Northern Spotted Owl

The Northern spotted owl lives and feeds only in heavily forested areas well removed from the potential use area for the alternative herbicides. As a result, no further consideration of this species is required in this assessment.

Bull Trout

Bull trout favor deep pools in cold rivers and large tributary streams, often in moderate to fast currents with temperatures of 45-50 F. They also favor large coldwater lakes and reservoirs. In the Deschutes River Basin in Oregon, Critical Habitat below Pelton Dam (in Jefferson County) has been designated for a total of 39 stream miles in various stretches between the dam and the Columbia River (extending through Wasco County). Since the GTCB growing site in Jefferson County is on the plateau east of and above the Deschutes River and essentially downstream from Pelton Dam, the potential effects of the alternative herbicides on Bull trout must be examined in detail.

In Malheur County, the Bull trout are found nearly 100 miles upstream from the where the Malheur River drains into the Snake River and are therefore not at risk from the use of the alternative herbicides.

In Canyon County, the designated Critical Habitat for Bull trout occurs above Lucky Peak Reservoir, well upstream from the GTCB growing site. As a result, the Bull trout in this county are also not at risk from the use of the alternative herbicides.

Steelhead

The Middle Columbia River Evolutionarily Significant Unit (ESU) of Steelhead trout has Critical Habitat designated in the Deschutes River up to Pelton Dam (through Wasco and Jefferson counties). Young Steelhead are aggressive swimmers and are likely to be found throughout migratory sections of the river and its tributaries. The potential effects of the alternative herbicides on Steelhead must therefore be examined in detail.

Chinook and Sockeye Salmon

Both Chinook and Sockeye salmon are listed in Wasco County, but are migratory in the Columbia River where dilution would negate any potential adverse impacts due to the use of alternative herbicides. As a result, neither species requires further examination in this assessment.

Plants

Herbicides are intended to adversely affect certain or many plant species. Therefore it is important to consider T&E plants in particular. However, the T&E plants nearest to the Canyon County sites are at least 75 miles or more away in Nez Perce County and the T&E plants nearest to the Jefferson County site are at least 80 miles away in the Willamette Valley. In both cases, the plants are separated from the growing sites by a mountain range.

On the basis of the above discussion, the species requiring further consideration are the Bald Eagle, Bull trout, and Steelhead in the counties listed in Table 4.

Table 4. Federally listed species in the potential use area requiring further analysis

Taxa	**Species**	**County**
Birds	Bald eagle (*Haliaeetus leucocephalus*)	OR: Jefferson, Malheur, Wasco ID: Canyon, Payette
Fish	Bull trout (*Salvelinus confluentus*)	OR: Jefferson, Wasco
	Steelhead (*Oncorhynchus mykiss*)	OR: Jefferson, Wasco

3. Ecotoxicological Risk Assessment

a. Goal of Analysis

For those species requiring further analysis (Table 4), the potential direct and indirect effects on the species from the use of the alternative herbicides can be examined in detail through an ecotoxicological risk assessment. With only three species remaining to be addressed in the endangered species assessment, it is reasonable to present the findings of the risk assessment in terms of the birds and fish in the proposed use area and the individual alternative herbicides.

b. Sources of Information

Information considered in the assessment of direct and indirect effects for the remaining alternative herbicide/taxa pairings was drawn from the following sources:

- EPA Reregistration Eligibility Documents (REDs)
- Interim Reregistration Eligibility Documents (IREDs)
- Product labels
- Material Safety Data Sheets
- GENEEC reference material
- U.S. EPA OPP ecotoxicology one-liner database
- Effects determinations resulting from the Washington Toxics Coalition lawsuit (*Washington Toxics Coalition et al. v. U.S. Environmental Protection Agency, 9th Circuit Court*)
- EXTOXNET - Extension TOXicology NETwork, University of California, Davis

c. Direct Effects Findings

In order to assess the direct effects of the alternative herbicides on the species of concern, it is appropriate to divide the remaining alternative herbicide/taxa pairings into three groups:

1. Pairings eliminated from further consideration due to the low acute toxicity of the herbicide to birds and fish and the lack of chronic exposure;
2. Pairings eliminated from further consideration due to the estimated environmental concentration (EEC) falling below the level of concern (LOC);
3. Pairings requiring measures to protect the species of concern.

1. Pairings Eliminated Due to Low Acute Toxicity and Lack of Chronic Exposure

Tables 5 and 6 provide LC50 values and supporting comments for birds and fish respectively. These tables show that a large number of alternative herbicide/taxa pairings can be eliminated from further consideration in the endangered species assessment because the herbicide is practically non-toxic and chronic exposure is unlikely.

In Tables 5 and 6 and in subsequent tables, the EECs were taken preferentially from RED or IREDs wherever possible. Otherwise, EECs were obtained from a GENEEC (U.S. EPA, 2001) estimate based on maximum possible exposure (0.067 ppm) for aquatic species or from Fletcher-modified Hoerger-Kenaga nomograms for terrestrial species (Fletcher *et al.*, 1994). Derivation of screening EECs by these methods is standard practice in ecotoxicological risk assessment, both at EPA and elsewhere.

Table 5. LC50 values for alternative herbicide/bird pairings eliminated due to low acute toxicity and lack of chronic exposure

Active Ingredient	LC50 for Birds (ppm)	Comments
Atrazine[1]	> 5000[3,4,E]	EEC < LOC
Bromacil[2]	> 10000[3,4,E]	EEC < LOC
Dazomet[1]	415[4,M]	Active ingredient is highly volatile and, therefore, is only applied by subterranean injection. As a result, exposure of piscivorous birds is unlikely.
Dimethenamid[1]	> 5620[3,4,E]	EEC < LOC
Ethofumesate[2]	> 5000[3,E]	EEC < LOC
Fluazifop[1]	> 4850[4,E]	EEC < LOC
Glufosinate-ammonium[1]	> 5000[3,4,5,E]	EEC < LOC
Glyphosate[1]	> 4640[3,4,E]	EEC < LOC
Hexazinone[1]	> 5000[3,E]	EEC < LOC
Imazapic-ammonium[1]	> 5000[3,4,E]	EEC < LOC
Imazapyr[1]	> 5000[3,4,E]	EEC < LOC
Imazaquin[1]	> 5000[3,4,E]	EEC < LOC
Mesotrione[1]	> 4720[3,E]	EEC < LOC
Metolachlor[1]	> 10000[3,4,E]	EEC < LOC
Nicosulfuron[1]	> 5000[3,4,E]	EEC < LOC
Norflurazon[1]	> 10000[3,4,E]	EEC < LOC
Oryzalin[1]	> 5000[3,4,E]	EEC < LOC
Oxyfluorfen[2]	> 5000[3,R]	EEC < LOC
Pendimethalin[1]	4187[3,E]	EEC < LOC for piscivorous birds
Pronamide[1]	> 10000[3,4,R]	EEC < LOC
Quizalofop[1]	> 5000[3,4,E]	EEC < LOC
Sethoxydim[1]	> 5620[3,4,E]	EEC < LOC
Sulfometuron[1]	> 4600[3,E]	EEC < LOC
Sulfosulfuron[1]	> 5310[3,4,E]	EEC < LOC
Trifloxysulfuron[1]	5620[3,4,M]	EEC < LOC
Trifluralin[1]	> 5000[3,4,E]	EEC < LOC

[1] Technical test substance
[2] Formulated test substance
[3] Bobwhite quail
[4] Mallard duck
[5] Japanese quail
[E] U.S. EPA OPP ecotoxicology one-liner database
[M] MSDS
[R] RED

Table 6. LC50 values for alternative herbicide/fish pairings eliminated due to low acute toxicity and lack of chronic exposure

Active Ingredient	LC50 for Fish (ppm)	Comments
Foramsulfuron[1]	> 100[2,E]	EEC < LOC
Glufosinate-ammonium[1]	> 320[2,E]	EEC < LOC
Glyphosate[1]	45-140[3,E]	EEC < LOC. EPA states that active ingredient is not expected to endanger aquatic organisms for all registered uses.
Hexazinone[1]	> 100[4,E]	EEC < LOC
Imazapic-ammonium[1]	> 100[2,E]	EEC < LOC
Imazapyr[1]	> 100[2,E]	EEC < LOC
Imazaquin[1]	280[2,E]	EEC < LOC
Mesotrione[1]	> 114[2,E]	EEC < LOC
Nicosulfuron[1]	> 1000[2,E]	EEC < LOC
Sethoxydim[1]	170[2,E]	EEC < LOC
Sulfometuron[1]	> 148[2,E]	EEC < LOC
Sulfosulfuron[1]	> 95[2,E]	EEC < LOC
Trifloxysulfuron[1]	103[2,3,M]	EEC < LOC

[1] Technical test substance
[2] Rainbow trout
[3] Bluegill sunfish
[4] Brook trout
[E] U.S. EPA OPP ecotoxicology one-liner database
[M] MSDS

2. Pairings Eliminated Due to the EEC Falling Below the LOC

Tables 7 and 8 provide LC50 values and supporting comments for birds and fish respectively and, in this case, show that several additional alternative herbicide/taxa pairings can be eliminated from further consideration in the endangered species assessment because the EEC is much lower than the LC50 and the risk quotient (RQ) falls below the LOC. In other words, the EEC is less than the LOC for each pairing. Note that for small mammals, a food source for the Bald Eagle, the concentration of alternative herbicides will be sufficiently low that adverse exposure is not likely.

Table 7. LC50 values for alternative herbicide/bird pairings eliminated due to the EEC falling below the LOC

Active Ingredient	LC50 for Birds (ppm)	Comments
Clethodim[1]	> 3978[3,E]	EEC < LOC
Diuron[2]	1730[4,E]	EEC < LOC for piscivorous bird species such as the Bald eagle.
Foramsulfuron[2]	> 4927[4,E]	EEC < LOC
Isoxaflutole[2]	> 4255[3,4,E]	EEC < LOC
Metribuzin[2]	> 4000[3,4,E]	EEC < LOC for application on vegetables and grasses. The active ingredient may be used to control bentgrass on these sites without risk of adverse exposure to birds.
Paraquat dichloride[1]	970[5,E]	Toxic only prior to spray-drying

[1] Formulated test substance
[2] Technical test substance
[3] Mallard duck
[4] Bobwhite quail
[5] Japanese quail
[E] U.S. EPA OPP ecotoxicology one-liner database

Table 8. LC50 values for alternative herbicide/fish pairings eliminated due to the EEC falling below the LOC

Active Ingredient	LC50 for Fish (ppm)	Comments
Atrazine[1]	4.50[3,E]	EEC < LOC. Secondary effects on food supply do not apply to fast-flowing deep waterways.
Clethodim[1]	18-56[3,U]	EEC < LOC
Dimethenamid[1]	2.60-3.97[3,E]	EEC < LOC
Fluazifop[1]	0.53[4,U]	EEC < LOC and active ingredient is rapidly hydrolyzed
Isoxaflutole[1]	> 1.70[3,E]	EEC < LOC. Adverse ecotoxicological risk seems unlikely.
Metolachlor[1]	3.90[3,E]	EEC < LOC for all uses except in shallow (< 6 in) ditches. Salmonids do not typically occupy irrigation or drainage ditches.
Metribuzin[1]	42-76[3,E]	EEC < LOC
Norflurazon[1]	8.10[3,E]	EEC < LOC
Oryzalin[1]	> 2.88[4,E]	EEC < LOC for all uses except where runoff occurs into shallow (< 6 in) ditches. Salmonids do not typically occupy irrigation or drainage ditches.
Paraquat dichloride[2]	15-39[3,E]	EEC < LOC
Pronamide[2]	72[3,R]	EEC < LOC
Quizalofop[1]	0.46-2.82[4,E]	EEC < LOC

[1] Technical test substance
[2] Formulated test substance
[3] Rainbow trout
[4] Bluegill sunfish

[E] U.S. EPA OPP ecotoxicology one-liner database
[U] University of California EXTOXNET
[R] RED

3. Pairings for which Use Precautions may be Considered

Table 9 provides LC50 values and supporting comments for fish and shows a small set of remaining alternative herbicide/taxa pairings that can be eliminated from further consideration in the endangered species assessment as long as the precautions proposed in the table are adopted. Some of the requirements designated in REDs have indicated the need for similar action, but it is not known at this time whether recommended actions have been transferred to label statements for products now being used in the field.

Table 9. LC50 values for alternative herbicide/fish pairings and suggested use precautions

Active Ingredient	LC50 for Fish (ppm)	Comments
Bromacil[1]	36[2,E]	EEC < LOC for rates ≤ 16.00 lbs/acre. *Precaution*: Use at rates < 16.00 lbs/acre.
Dazomet[1]	0.16[3,E]	Active ingredient is highly volatile and is applied by subterranean injection. *Precaution:* Do not use along waterways.
Diuron[1]	0.71-1.40[4,E]	EEC < LOC except for high rates (≥ 12 lbs/acre) on walnuts, filberts, and peaches *Precaution*: Use at rates < 12.00 lbs/acre.
Ethofumesate[1]	0.75-17.50[3,E]	High variation found in reported reference data. Some sources give LC50 values of > 180 ppm for most sensitive species. Note: there is very high variation in reported LC50 values for this active ingredient. *Precaution*: Do not use along waterways.
Oxyfluorfen[1]	0.20[2,E]	EEC < LOC except for application on fruits, nuts, and vegetables. *Precaution*: Do not use on grapes, fruits, nuts, and vegetables in proximity of habitat. US FWS has determined Reasonable and Prudent Alternatives to avoid jeopardy to endangered fish species when product is applied to rights of way, fence rows, and levee banks.
Pendimethalin[1]	0.14[3,E]	High potential risk when applied on any crops except soybeans. *Precaution*: Do not use along waterways.
Trifluralin[1]	0.01-0.06[2]	High potential risk when applied on any crops. *Precaution*: Do not use along waterways.

[1] Technical test substance
[2] Bluegill sunfish
[3] Rainbow trout
[4] Cutthroat trout
[E] U.S. EPA OPP ecotoxicology one-liner database
[R] RED

d. Indirect Effects Findings

Indirect effects of glyphosate or the alternative herbicides would be those effects on the food or cover of the Bull trout, Middle Columbia River Steelhead ESU, and the Bald eagle. Because of the size and flow

characteristics of the Deschutes River habitat for the Bull trout and Steelhead, any indirect effects of glyphosate and the alternative herbicides would be minimal and transient. The same conclusion would also apply to the Columbia, Snake, and Boise rivers.

Indirect effects due to the toxicity of herbicides on aquatic invertebrates that serve as food organisms for Bull trout and Steelhead are unlikely. Many of the alternative herbicides are less toxic to aquatic invertebrates than they are to fish, and none are sufficiently toxic to the aquatic invertebrates to cause population effects. Therefore, it is very unlikely that the EEC will exceed the population LOC for these crustaceans if the EEC does not exceed the LOC for individuals of the fish species of interest. Also unlikely are indirect effects due to the toxicity of herbicides on macrophyte plant cover, due to transient low level exposure in large, deep, fast flowing rivers.

Indirect effects will not be a concern for the Bald eagle. Food for the Bald eagle would not be affected because individuals of T&E fish species, which may serve as food, are not at risk according to the assessment presented here. In addition, there is negligible chance that small mammals, a less important food source for eagles, could be affected. Finally, herbicides would not be used to control vegetation that provides eagle habitat.

4. Conclusion

An endangered species assessment is presented that addresses the potential risks of certain herbicides to federally listed Threatened and Endangered (T&E) species as a result of the possible off-target impacts from planting of GTCB for seed production in three locations in Oregon and Idaho. Transport of seed and pollen by wind or water and, possibly, gene transfer could lead to the unintended growth of GTCB or GT hybrids in areas beyond the seed production sites. As result, the use of herbicides other than glyphosate may be required for vegetation management. The potential use area was identified for 32 such "alternative" herbicides, covering a total of five counties.

Of the six T&E species existing in the potential use area, three (Northern spotted owl and Chinook and Sockeye salmon) were excluded from consideration on the grounds that their habitats are sufficiently removed from the potential use area that exposure to the alternative herbicides will not occur. A preliminary ecotoxicological risk assessment was conducted to determine the likelihood of adverse impacts upon the remaining three species (Bald eagle, Bull trout, and Steelhead) due to the use of the alternative herbicides.

This risk assessment showed that for birds, 26 herbicides can be eliminated from further consideration due to the low acute toxicity of the herbicide and the lack of chronic exposure. For fish, 13 herbicides can be eliminated from further consideration for the same reason. For birds, 6 herbicides can be eliminated from further consideration due to the estimated environmental concentration (EEC) falling below the level of concern (LOC). For fish, 12 herbicides can be eliminated from further consideration for the same reason. For fish, the risk assessment showed that certain precautions will ensure that the use of 7 herbicides will not adversely impact species of this taxon. No such precautions were found to be required for birds.

On the basis of this assessment, there are a number of alternative herbicides that can be used without presenting potential risks to T&E species. There is also a subset of alternative herbicides that, with certain precautions, can also be used without presenting potential risk to T&E species. None of the identified alternatives to glyphosate would need to be completely eliminated from use should GTCB control be necessary. Consequently, should there be a need to control GTCB, a suite of herbicides is available to provide such control without adverse impact on T&E species in the vicinity of the counties considered in the assessment.

5. References

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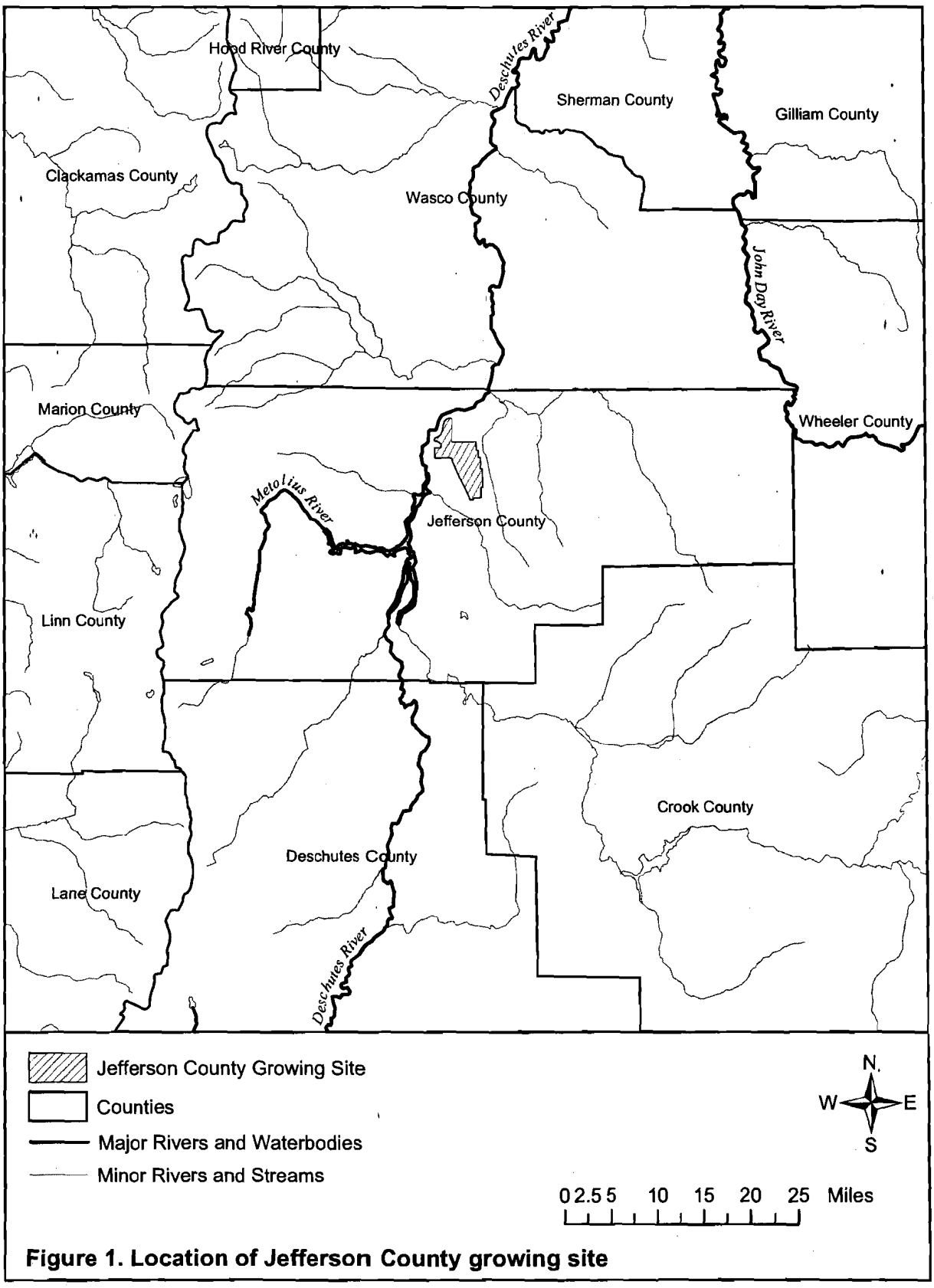

Figure 1. Location of Jefferson County growing site

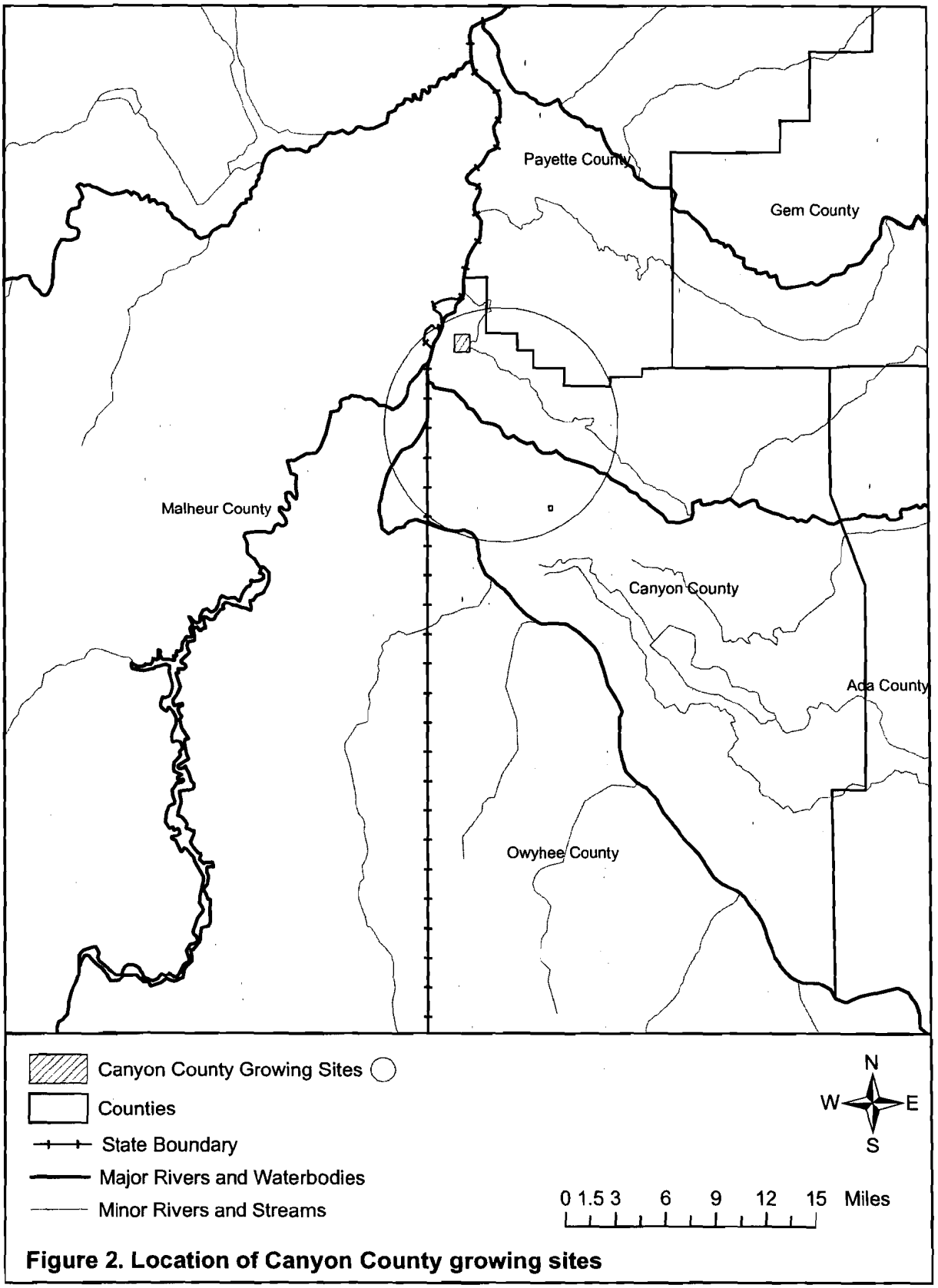

Figure 2. Location of Canyon County growing sites

Figure 3. Threatened and Endangered Birds in Oregon and Idaho

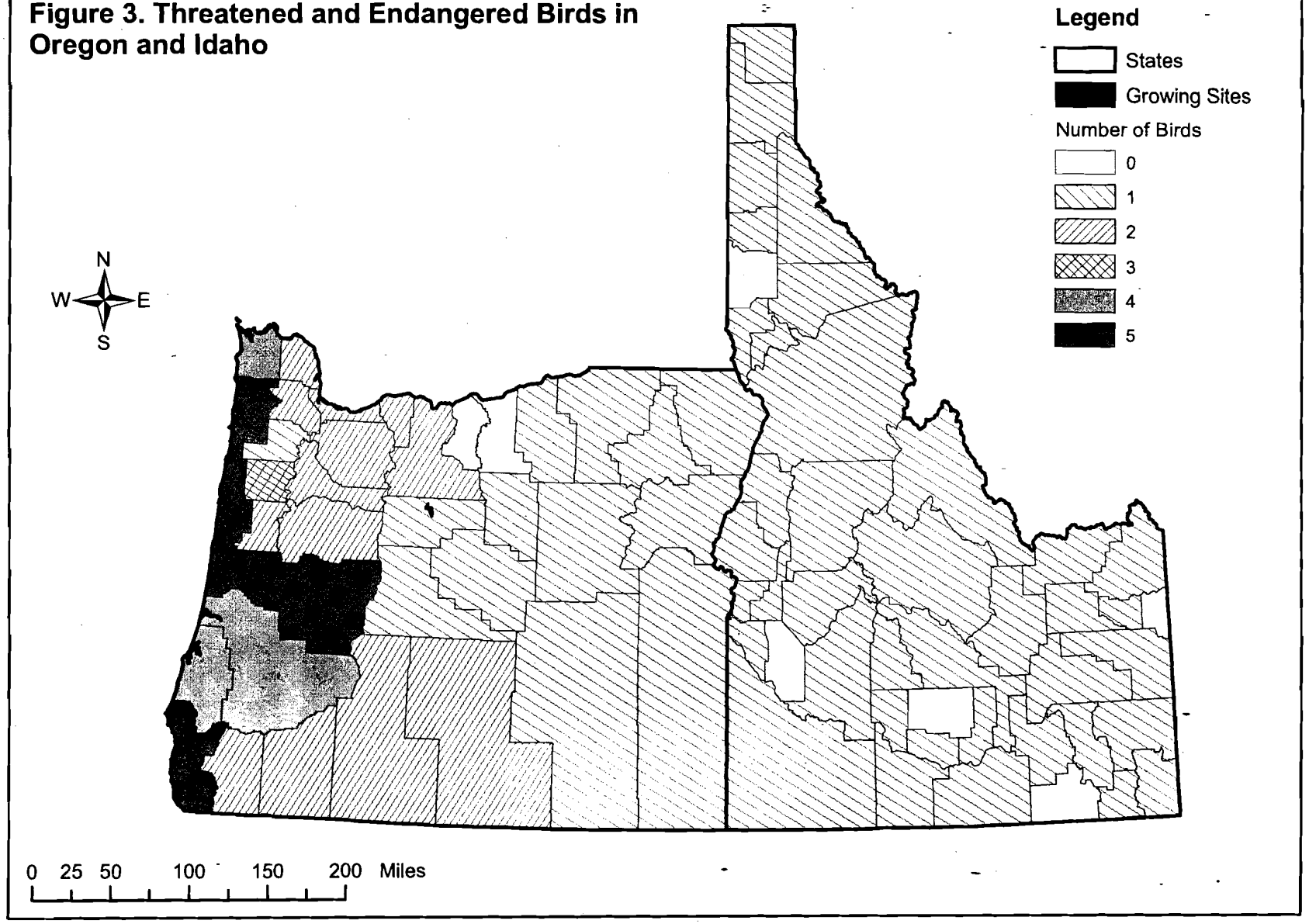

Figure 4. Threatened and Endangered Fish in Oregon and Idaho

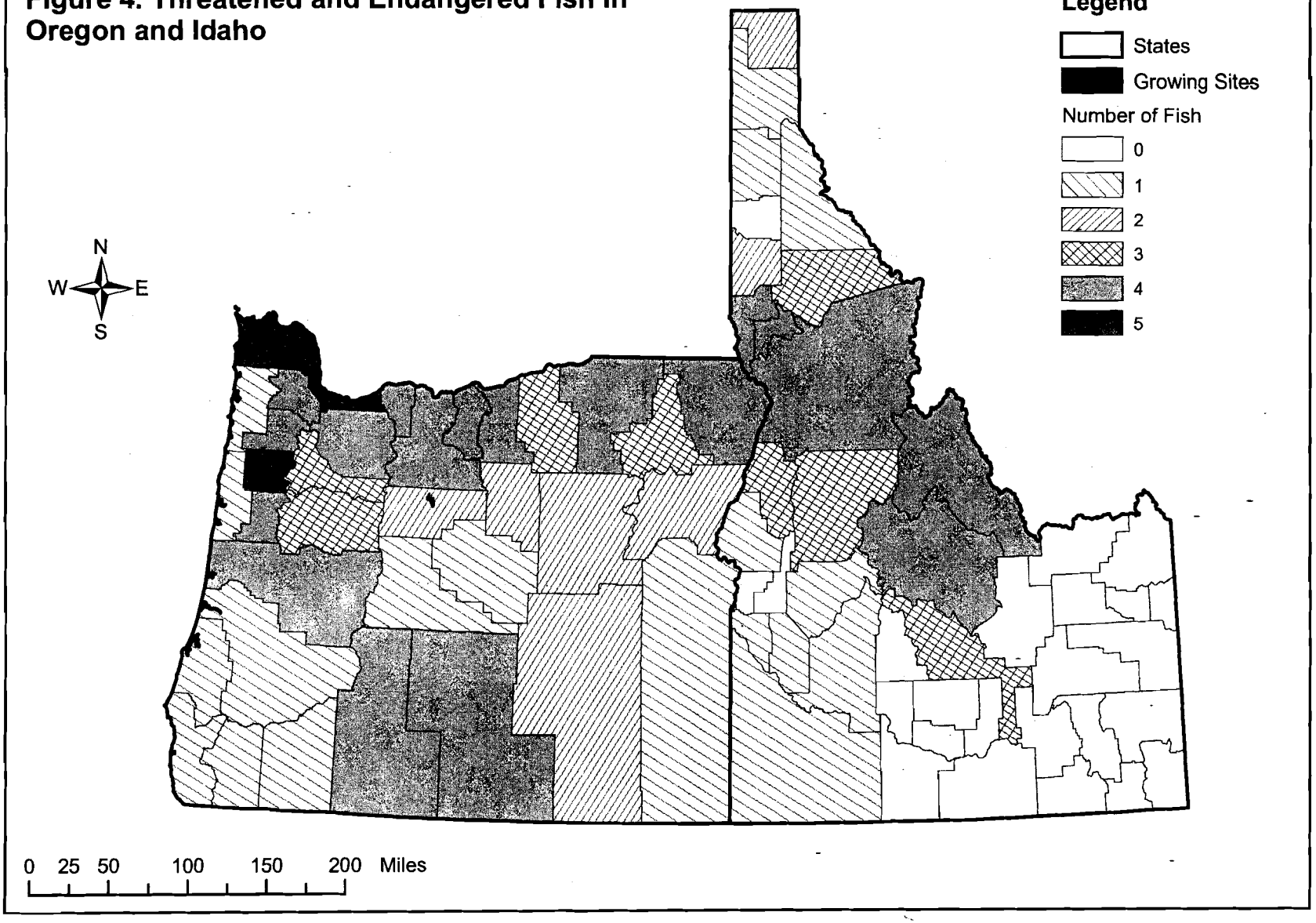

Figure 5. Threatened and Endangered Insects in Oregon and Idaho

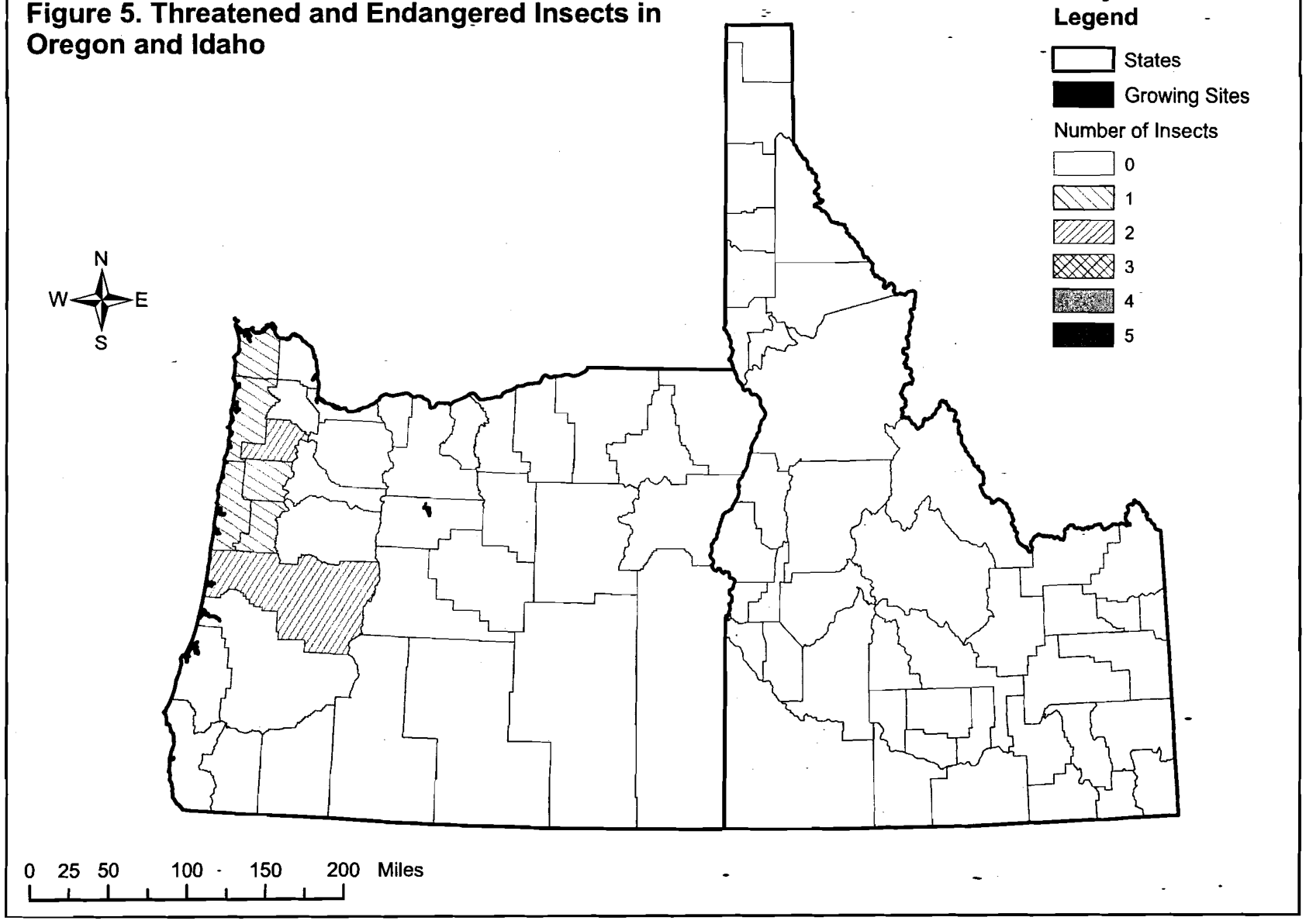

Figure 6. Threatened and Endangered Mammals in Oregon and Idaho

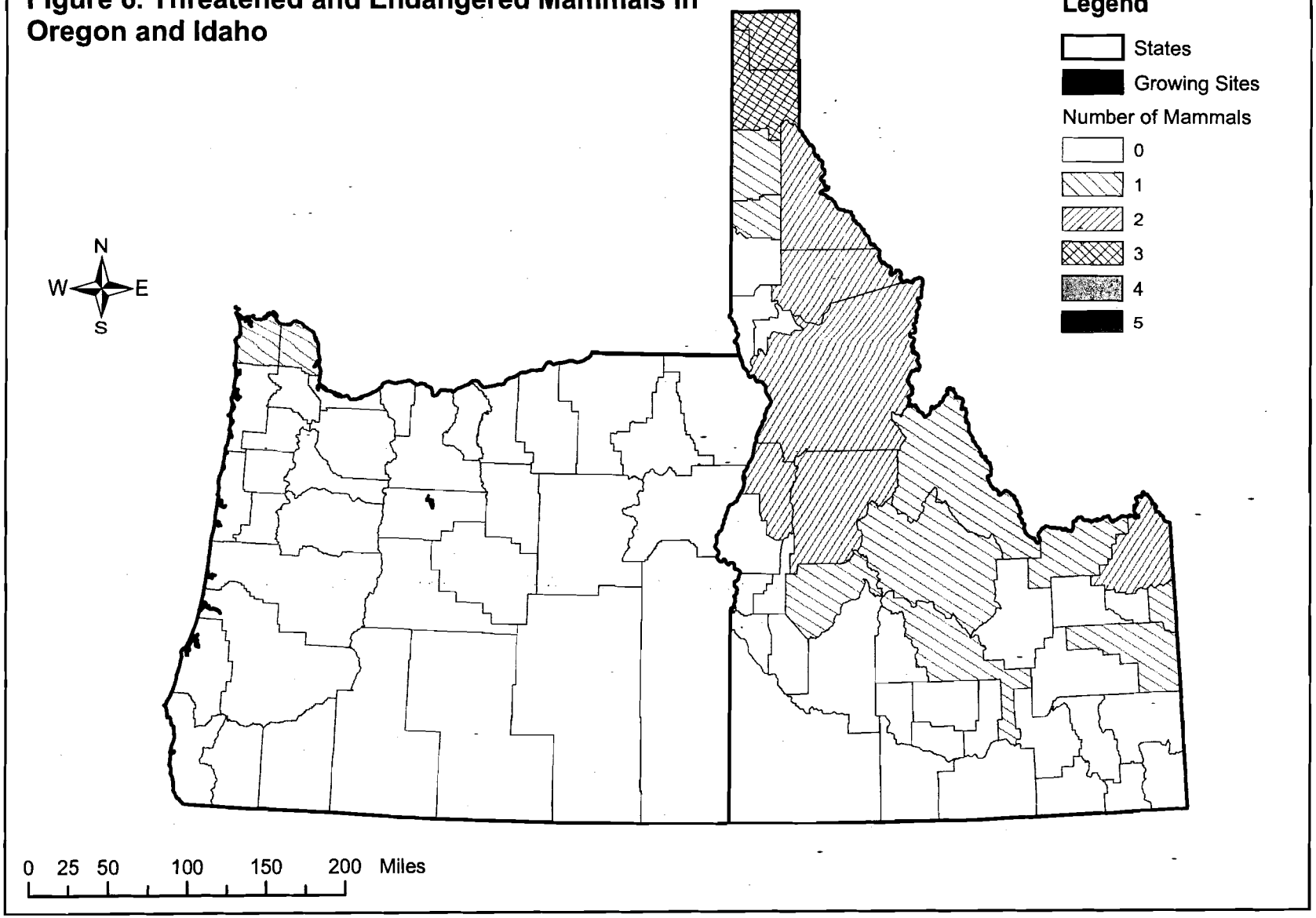

Figure 7. Threatened and Endangered Plants in Oregon and Idaho

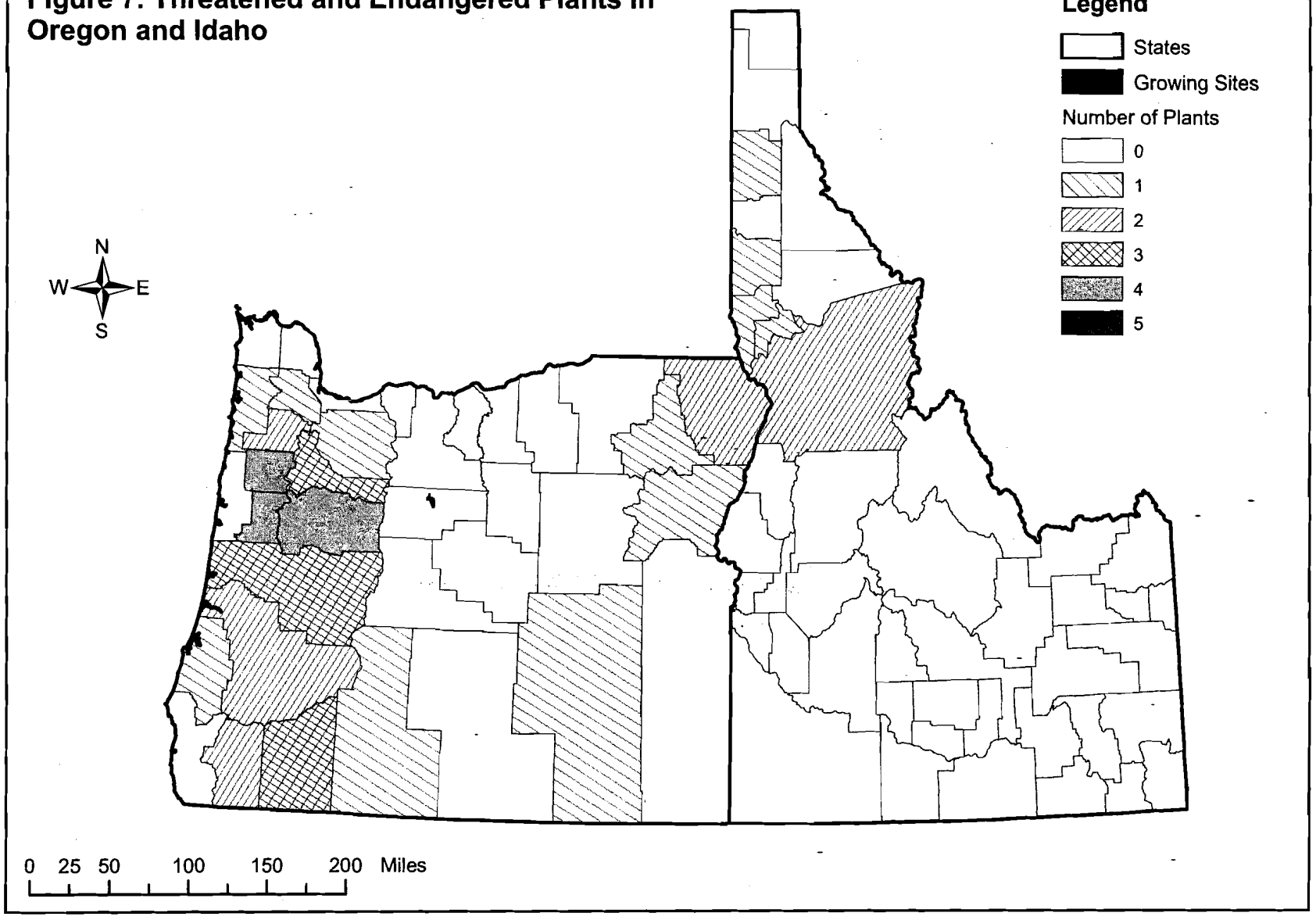

Figure 8. Threatened and Endangered Snails in Oregon and Idaho